

2

Early Forest Management in Scotland's Plantations

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Probably nothing has affected the distribution of trees around the world more than the perceived requirements and rewards of plantations. Take the eucalypts, for example. From the 1850s, when Portugal started, eucalypts have been planted in Spain, Brazil, India, Israel and elsewhere. On one hand their high absorption of water helped the fight against malaria in the nineteenth century. On the other hand, they reduced the care and development of native woods, and farmers saw them as providing little fodder for cattle (Radkau 2012: 320-1). Australia is apparently unusual in predominantly planting native trees, despite the radiata pine plantations in various places.

Although some internationally influential writers like Joachim Radkau and Oliver Rackham have argued for wood-pasture as a long established structure in historical times, and one that largely maintained the size and shape of existing forests over centuries, and although some existing Scottish woods are indeed more or less where woods have been for centuries, most Scottish experience differed. Chris Smout (2003) believes that no woods have been as much affected by human activity as the Scottish people who have been separated from their forests for centuries. By the eighteenth century woods only covered a maximum of ten percent of the Highlands, and much was still bare rock. Planting, however, was beginning to be more popular.

Thomas, 6th Earl of Haddington, was a self-effacing man. Writing to his grandson in 1733 he claimed, 'I will be bold to say that planting was not well understood in this country till this century began. I think it was the late Earl of Mar that first introduced the wilderness way of planting amongst us and very much improved the taste of our gentlemen who very soon followed his example' (Grigor 1868: 21-2). It was, he said, his wife who had sold her jewels to enable her to plant Binning Wood in 1705, and it took years of persuasion before she interested Haddington himself in the work and he 'resolved to have a wilderness'. He later wrote the first book published in Scotland specifically on woods; *A Treatise on the Manner of Raising Forest Trees*, published in 1761. He planted primarily hardwoods, so that the 6000 acres [2400 ha] under 'natural and artificial woods' was described in the mid-nineteenth century as 'the most magnificent forest in the lowlands of Scotland' (Grigor 1868), (Figure 1). Sadly, Binning was utterly destroyed in World War II from providing timber for the war effort.



Figure 1: Before its destruction for the war effort, postcards of Haddington's famous Binning wood were popular with tourists

Haddington was probably right in attributing importance to the Earl of Mar in promoting plantations in Scotland. Mar had concluded that if Scotland was to recover its autonomy after the 1707 Act of Union, it had to develop its industry and its infrastructure, as the French were doing, and on his own estate in Alloa he included forestry plantations (Stewart 2012). The people whom Haddington lists as those early concerned with plantations, with the exception of the Duke of Argyll, had their estates on Scotland's east coast and fairly near to Edinburgh. By 1716 at the latest, however, when Sir Alexander Grant began planting, the enthusiasm appears to have spread to the more Highland areas. Sir Archibald Grant took up the practice, especially as he needed fuel for iron mines in which he had an interest. The leaders were 'the planting dukes'; Atholl, Argyle, and Buccleuch; the Marquis of Montrose; and the Earls of Seaforth and Breadalbane (Cregeen 1964: 132-4).

There can be little doubt that a major active interest in plantations was developing around 1700 although there had been earlier activity on some of the bigger private estates. As early as 1586, James the 5th Lord Ogilvie wrote thanking David Lindsay of Edzell for a thousand young birches for his planting (Tansley 1939: 183). Nevertheless, when in 1677 Thomas Kirk of Cookridge, Yorkshire kept his diary of a tour of Scotland's east coast, he noted around Edinburgh, 'many fine seats, every half mile we saw a fine house in a grove of trees...though there be not a tree in any part of the country about them.' The architectural aspect of trees was one reason for their appearance around stately homes where they complemented the whole impression intended. It was not until Kirk got to Dornoch and went up the Kyle of Sutherland to see a fir wood that 'there were many woods together extending many miles wherein are many larger trees than any we saw though those we did see were very high and straight but of no great substance, about a man's fathom'.

By this time John Evelyn's arguments in *Sylva* that 'heathy and hopeless grounds, and barren hills as any in England, that do now bear, or lately have born woods, groves, and copses, which yield the owners more wealth, than the richest and most opulent wheat-lands' were bearing fruit. He inspired gentlemen to surround their residences with trees, and spoke of the ways of plantation that are still our concerns:

For though it seem but a trivial design that one should make a nursery of foresters; yet it is not to be imagin'd, without the experience of it, what prodigious numbers a very small spot of ground well cultivated, and destin'd for this purpose, would be able to furnish towards the sending forth of yearly colonies into all the naked quarters of a lordship, or demesnes....

Wood shortages elsewhere in Europe were causing some concentration on seeking a way of sustaining timber supply. Hans Carl von Carlowitz wrote *Sylviculturae oeconomica* in 1713, generally promoted as the first book on forest management and sustained yield, although that is doubtful. Wood shortages went hand in hand with a growing interest in botany and the development of Botanic Gardens. In Scotland, Sir Robert Sibbald, first Professor of Medicine at Edinburgh and one of the founders of the Royal College of Physicians there founded a botanic garden in 1667 mainly for medicinal plants, but he also collected trees in his early herbarium (Sibbald 1833: 31). Systematic attempts to record all the local species of plants in an area were becoming fashionable.

As early as 1683 John Reid in the *Scots Gard'ner*, the first book printed on the subject in Scotland, and dedicated 'To all the Ingenious Planters in Scotland', had a chapter on how to propagate and order 'forrest-trees' (Reid 1907: pt. 2, ch. 3), (Figure 2). He had, he claimed, experimented with various ways of propagation, dismissed the value of using suckers or layers, and recommended raising trees from seed. He recommended a seminary (seed plot in a nursery) 'well-ordered and handsomely made up in beds'. The seeds were to be sown 'in their respective seasons' kept weed free and watered, sheltered left in the seed bed for one, or in some cases two years:

...then remove and plant in the nursery, in distance a foot one way, half a foot the other, or five rows in the bed (if six feet broad) in straight lines, having first pruned their roots, especially 'toped' the main root that runs straight down; so shall they send forth side or seeding roots and agree well with transplanting thereafter. Also proportion the head to the root, by pruning up the side boughs, reserving some of the smallest afterwards all the way on the body to stop the sap in its course, that the tree may grow great with its height and this will prove the best fortification against the winds.

He goes on with more details, 'They are to stand three years at most in the nursery and then to be replanted in spade-bit trenches three foot one way and two the other....until they be ready for planting out in avenues, parks, groves &c.... He specifies that 'the seeds should be taken from the high, straight and young thriving trees'. He distinguishes what should be done with the main trees known to him; and he explains in detail how to manage planted trees – recommending that this be done in autumn, talking of pruning and of the need to enclose with hedges if possible.

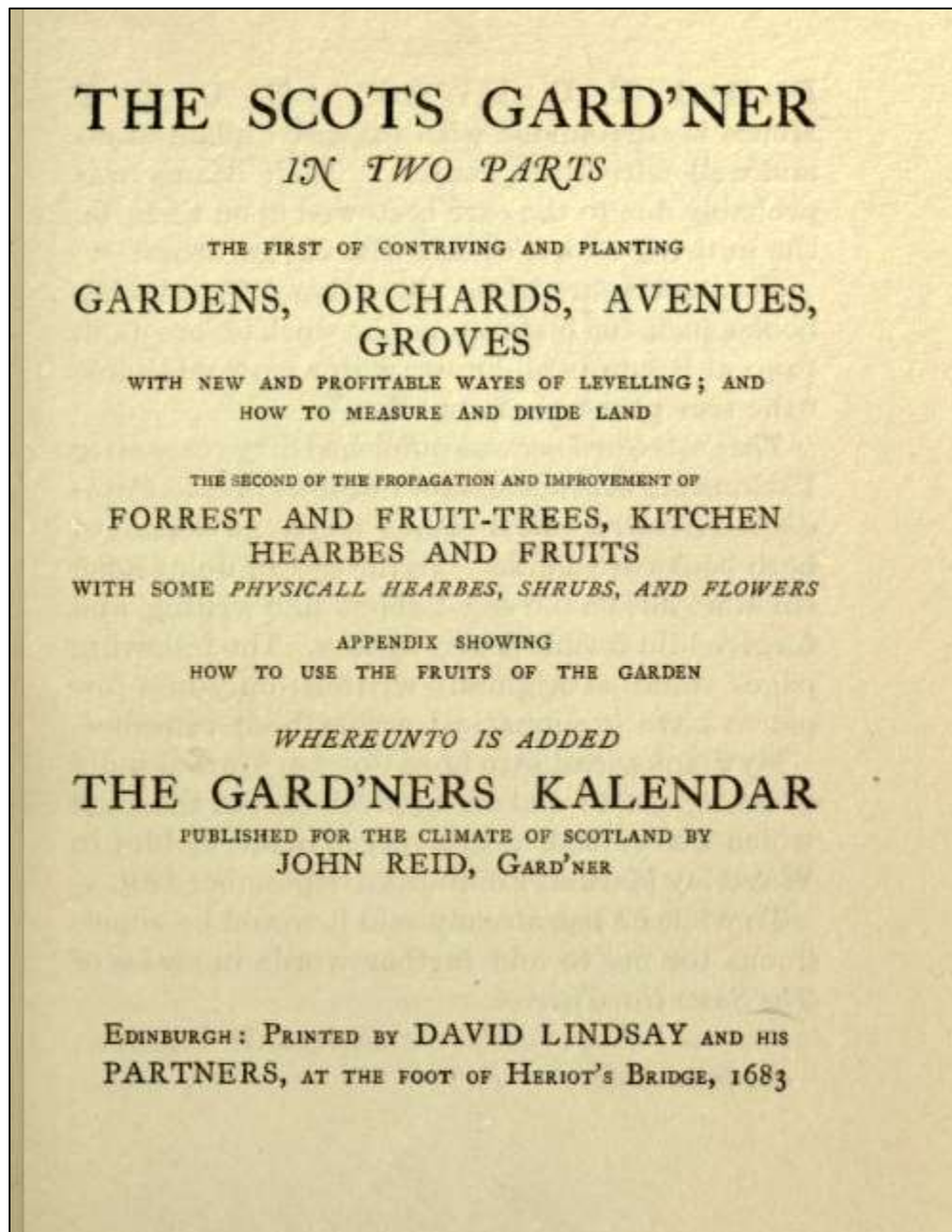


Figure 2: Title page of John Reid's book

Scottish native woodland types, as Reid noted, differed from those elsewhere and fell into distinct categories. Pinewoods, oak/birch woodlands, ash woodlands and wet woodlands were the principal types. Unlike English woods, they generally lacked shade-tolerant species with the exception of wych elm, alder and holly. The woods had different ways of reproducing themselves naturally and pine woods were difficult because they depended on the seeds being carried to new ground (in the direction of the prevailing wind). By 1700 there was only a limited amount of native pine woods, and deciduous woods, especially of birch and oak were more common.

The planters experimented with different methods of planting. Lord and Lady Hamilton in 1705 successfully planted pine on 800 acres of poor sandy soil and their practice was followed profitably thereafter. By 1700, Sir William Bruce, the most highly regarded Scottish architect at the beginning of the

eighteenth century, with his son had planted 100,000 oak, ash, elm and Scots pine on their Kinross estate to provide a backdrop for the formal Franco-Dutch garden style that was popular in their day. A chestnut tree, still standing in the garden is thought to be an original one. Another earlier eighteenth century architect who valued afforestation was William Adams of Blair Adam, also in Kinrossshire, who drained and reclaimed moor to plant trees, and also built over sixty miles of roads to supply them. Alexander Murray at Sunart was perhaps typical, being 'full of the new ideas about agricultural improvements and a determination to carry them out'; however, he and his brother Charles were not very successful.

As outsiders they met resistance above their ability to overcome (Dye 2001:16). As Lindsay has shown, this resistance was critical for maintaining the traditional Highland economy of animal husbandry. The map of the barony of Slisgarrow in 1756 shows rough pasture accounted for nearly eighty percent of the total area – only twenty percent was under pine and birch woods, infield and outfield, and riverine meadow (Lindsay 1977:24). Turning more over to forest would be disastrous for the four main tenants and their sub-tenants.

As the records of the forfeited estates show, some of the afforestation was done by the commissioners appointed to manage forfeited estates after 1715 and 1745 who had no commitment to their followers to impede them (Millar, 1909). Much was also done by landowners who had avoided this fate so that the eighteenth century has been called the Golden Age of tree planting in Scotland. Nevertheless in 1750 when a survey was carried out, woodland still covered no more than five percent of the Highland area (Lindsay 1977:26). A good general survey of the level of afforestation in different counties can be gathered from the antiquarian works of the early nineteenth century, like that of Thomas Hunter on Perthshire which sought to enumerate the names and histories of the great county families. Collections of letters, like those of George Dempster to Adam Fergusson (1756-1813) also show how men, deeply involved in the politics and economy of their nation, saw plantations as an important element in dragging the culture into the 'modern age'. Dempster ruefully acknowledged that 'although a very steady man undertaking the improvement of an uncultivated estate would not find it a very great source of wealth as well as an innocent and active amusement — provided he serves an apprenticeship to a farmer and copies his master's economy both at home and in the field' (Fergusson 1934: 116-7, 137b).

The distinction between managing existing woodland and establishing new plantations in Scotland can often be difficult to establish since the practices of re-establishing over-exploited former scots pine woods were not necessarily significantly different from starting more or less from scratch. Unlike England, much Scottish copse wood was quite diverse, simply regenerated from the 'haphazard natural mixture of species commonly including as well as oak—birch, rowan, hazel, ash alder, willow and thorn' (Fowler 2002: 67). To compound the problem of definition, experienced foresters advocated not only plantations but also the restoration of existing woodland. Some of the early planters were almost certainly re-establishing management of areas where woods had always existed.

The northern pine woods had survived into the seventeenth century because they were unprofitable, but in the early eighteenth century the trees suitable for masts and spars became part of the York Buildings Company's machinations. They were sold to entrepreneurs who finally brought out of the pine woods by harnessing flood water (Fowler 2002: 70-75). Elizabeth Grant in her autobiography nearly a century later provides a lively account of the process;

The number of people employed in the forest was great. At this winter season little could be done beyond felling the tree, lopping the branches, barking the log, while the weather remained open... The logs prepared by the lopper had to be drawn by horses to the nearest running water and there left in large quantities till the proper time for sending them down the streams,...It was a busy scene all through the

forest...this driving lasted till sufficient timber was collected to render the opening of the sluices profitable.

Formerly small sawmills had been erected wherever there was sufficient water-power, near the part of the forest where the felling was going on, and the deals when cut were carted down to the Spey:

It was picturesque to come suddenly out of the gloom of the pine-trees, on to a little patch of cultivation near a stream with a cottage or two and a saw-mill at work, itself an object of interest in a rude landscape....In order to have a run of water at command, the sources of the little rivers were managed artificially... (Grant 1911: 218-29).

Grant goes on to describe at length the way the timber was carried into the water and how rafts were made at the Spey by the Ballindalloch men to carry it further.

Establishing new plantations was easier if the land was not wanted for crops or grazing because it was too steep, exposed to sea-wind or infertile, but nothing lacked problems. In Scotland there was a clear distinction between managing oak forest, where coppicing or pollarding was standard practice, and pine woods where the trees did not regenerate in that way. Pennant, touring in Scotland in 1769 wrote of Dupplin, the Earl of Kinnoul's residence;

...behind are plantations extending several miles in length; all flourish greatly except those of ash. I remarked in the woods some very large chestnuts, horse-chestnuts spruce and silver firs, cedar and arbor vitae. Broad leaved laburnum thrives in this country greatly, grows to a great size and the wood is used in fineering. Lord Kinnoul planted last year not fewer than eighty thousand trees, *besides Scotch firs* (Pennant 1776: 84).

We can conclude that these were mixed plantations, even if the different species were kept separate. None of them apparently were as yet 'new' trees.

The problems with planting for economic benefit was the initial expense of draining, enclosing and planting, the choice of species (for each had a different possible use); and then of thinning and weeding, measuring the palings, keeping cattle out through the period needed for growth, and finally transporting the final products. Woods required time until they were well established and before they yielded financial returns. A move to plant was really only possible for the great landowners, those like the Campbell Earls of Breadalbane who had lands covering 437,696 acres [177,129 ha] stretching over 100 miles [160 km] from Aberfeldy in the east, to the west coast. Many tenants lost their access to the wasteland and took every opportunity to impede plantation establishment. Left unsupervised, as Haddington noted, they would pull up the hedges, plough down the banks and let the drains fill up. Transforming tenants was also a long term labour and not necessarily legally possible where entails and mortgages were involved. It took an act of Parliament in 1770 to allow proprietors of such estates to manage them with improvement in view. After the Act, and with his estates restored to him, Breadalbane established villages at Acharn, Achloa, Crofmoraig, Stix and Stonefearnan at the end of the eighteenth century in order to have workers at his beck and call; and he also planned small towns at Kenmore, Killin and Taymouth (Houston 2014). However, this was exceptional, as it seems that most landlords preferred to permit pasturing rather than the enclosure that discomfited their tenants.

Even where trees reached a suitable size for culling, however, and were put up for auction which was the usual way of organizing the cut, the owners could not expect the same return for Scottish wood planks as imported overseas timber was of better quality, Scottish boards were not deemed as good and were not deemed suitable for any fine work. Wood for other purposes was therefore more remunerative. One thing

that had protected some of the native woods was the difficulty of access. In the eighteenth century, however, an effective way of floating timber down the rivers when they were in spate (flood) made the upstream resources accessible for the first time.

The economic return on woods was, nevertheless, an important element of the reviving interest but it was not the only one. This was all part of an aspect of the Enlightenment investigation of science that was examining the principle of transpiration in plants, and was developing a sophisticated theory about the connection between trees and climate (Grove 1996). Long-standing notions that the sea air and north-east winds (on the east coast of Scotland) would prevent trees from growing were being discarded. The intellectual links between Scotland and Europe at this time were influential in affecting practices on both sides of the channel. Haddington and others were in touch with people like Georges Louis Leclerc and Buffon whose paper '*Sur la conservation et le retablisement des forests* (On the conservation and restoration of forests)' to the French Academy was one of two translations printed as appendixes to Haddington's book. Part of the discussion turned on the sort of woods that should be aimed for. Buffon and Henri-Louis Duhamel du Monceau were experimenting with various species of trees and favoured mixed woods for what we would now call ecological reasons, but Haddington dismissed the necessity of this. Buffon in particular was recording this although it does not look as if anyone was yet aware of what we would call genetic variability within species (Roger 1999:121).

Amongst other things with which they were experimenting was the best form for a plantation to take. Was it necessary to the success of a plantation of timber trees in a good soil to intermix the tree species? (Sinclair 1794: 251). By the time William Marshall was writing in 1796 it is clear that much hill planting on land that had lost its natural cover was confined to one or two species –spruce and European pines - which were hardier and larger than the native Scotch pine (McGowan and Dingwall 2011). Another import that was rapidly becoming heavily used was larch. It grew quickly and was not fussy about soil. Another of the issues was how to ensure that the trees were protected. The threat of wind and flood was considerable along the coasts where it would be easiest to transport timber away. Experimentation with pine woods along the shoreline and on other sandy soils led to the development of sheltering practices.

By this time there was considerable enthusiasm for substantial books on forests and their management. William Boutcher, a nurseryman, in 1775, produced one in Edinburgh, *A Treatise on Forest trees* which had a substantial subscription list of gentlemen then taking an interest, and often an active interest, in planting (Figure 3). One of his objects was to promote the idea of premiums being given by the Commissioners and Trustees for manufactures and improvements in Scotland for 'the person who shall raise, from the youngest to the largest plantable sizes the greatest quantity of the best cultivated fruit and forest-trees, Hedge plants and other useful nursery-articles'(Boutcher 1775: xiv). He also sought to argue that seedlings should be grown on good land, not, as it was argued, on poor soil although not on land 'forced and pampered' with dung. After a careful description of the main trees grown in Scotland he ends with a chapter on establishing a forest from scratch.

T R E A T I S E
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Not only the best Methods of their CULTURE hitherto practised,
but a variety of new and useful DISCOVERIES, the result of
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success ;

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On the same principles, (with as certain success) for transplanting HEDGES
of sundry kinds, which will at once resist Cattle :

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D I R E C T I O N S for the Disposition, Planting, and Culture of H E D G E S,
by observing which, they will be handfomer and stronger Fences in five years,
than they now usually are in ten.

By W I L L I A M B O U T C H E R, N U R S E R Y M A N,
A T C O M E L Y - G A R D E N, E D I N B U R G H.

Who then shall grace, or who improve the soil ?

Who plants like BATHURST, or who builds like BOYLE.

'Tis use alone that sanctifies expence,

And splendor borrows all her rays from sense.

POPE.

E D I N B U R G H :

Printed by R. FLEMING, and sold by the AUTHOR, by J. MURRAY, No. 32.
Fleet-street, London, and the other Bookellers in Great Britain.

M. D C C. L X X V.

Figure 3: Title page of William Boutcher's book

Sir John Sinclair prepared a general statistical report on the agricultural state of Scotland in the late 1790s and handed a copy of the volume on woods to the Reverend Patrick Graham of Aberfoyle, an enthusiast who considered the position of woodland management was fairly well established (Sinclair 1794). Graham said that the woods constituted 'to a considerable extent [Scotland's] wealth'. He spoke of 14 million unused acres [5.6 million ha], at least one fourth of which was suited to timber. This, he wrote, should be of interest to the navy; as he doubtless knew that in the middle of the French wars timber shortage was a crucial problem. He regretted the reluctance of proprietors 'to encounter the expense of draining, enclosing and planting these barren wastes...' and urged that 'districts where even coppice wood abound,

as in Stirlingshire, Perthshire and the continental districts of Argyleshire but especially where the Scotch fir and larch are cultivated, we meet with comfortable dwellings...'. He also stressed national benefit:

... almost all natural oak in Perthshire, Stirlingshire Dumbartonshire, Argyleshire Invernesshire very extensive tracts of oak coppice abound which now under a regular system of management yield an important addition to the income of the landholder, and contribute to many useful purposes of domestic economy. The plan happily adopted on many estates in the western and northern counties and particularly on the Duke of Montrose's estates in Stirlingshire and Perthshire of reserving at every cutting a certain number of oaks of the finest form and most promising growth gives us a fair prospect of possessing in a few years even timber fit for naval purposes (Sinclair 1794: 203), (Figure 4).



Figure 4: Larachmor gardens, which were structured from and incorporate parts of a tree nursery in Inverness, where the layout of the nursery can still be perceived beneath the later changes. *Photo:* The author

This was not a really immediate prospect even if the *Glenmore* in the British Navy had been built entirely of scotch fir. The trees were mostly grown for the bark that was used for tanning leather. Other products were liquid resin or turpentine. Juice extracts were yellow resin, essential oil, common resin, black resin, tar, tar water, pitch lamp black and bark bread.

Graham significantly said that it was not necessary, contrary to the opinion of M de Buffon, to the success of a plantation of timber trees in a good soil that the species of trees should be intermixed. In Graham's view, 'Plantation became very general in Scotland between the years 1730-60 by the exertions and examples, of Archibald, Duke of Argyle, the Duke of Athol, the Earls of Bute, Loudon Hyndford and

Panmure, Sir James Nassmyth, Sir Archibald Grant, Mr Fletcher of Salton and others.’ Graham was promoting larch as ‘perhaps the most important acquisition, in respect to timber that has ever been made.’ Adaptable and suited to elevated situations and not very rich soil, it had been introduced at least sixty years before and trees of that age were already large. He also went through every other species, explaining their potential use. We get some idea of the way in which plantations were managed with a wood-officer to superintend, keep cattle out, and oversee the thinning and weeding, measuring the palings and enclosing.

By the nineteenth century, planting woods where they had been absent for many years had become common. The powerful landowners chose to plant mainly species previously unknown in Scotland such as the spruce and larch that would grow readily and rapidly in conditions native species avoided, and this altered the ecology. By the end of the century Scotland had one of the earliest and most effective forestry departments. In the twentieth century, the area that had been under wood in the late nineteenth century was dramatically increased through plantations, mainly of non-indigenous species. What the foresters originally achieved was not conservation, but was colonisation with an ecological pattern in plantations that is markedly different from that in remnant woods. Scottish forestry is now heavily involved in promoting the preservation of the six forms of native woodlands: lowland mixed broadleaved woods, upland mixed ash woods, upland oak woods, upland birch woods, native pine woods and wet woodlands, each of which have their distinctive ecological character (Wilson, 1966). This does not sit easily with their need to be financially acceptable. If ideas about the nature of past forms of woodland are to change drastically they may need to re-evaluate their projects.

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